

## **REMARKS**

The following remarks are in response to Third Office Action dated September 20, 2004. As reflected above, claims 1, 6-20, 22-26, 31-45 and 47-50 are now pending in this application. Before addressing the merits of the Action, Applicants wish to thank Examiner for indication of allowability of claims 36-45.

### **35 USC 101 Rejection:**

Claims 1, 6-20, and 22-25 stand rejected under 35 U.S.C. 101 as being directed non-statutory subject matter. The Action states that the claimed invention is non-statutory because it merely manipulates pulse characteristics, which the Action characterizes as an abstract idea outside of the four statutory classes of process, machines, manufacture and composition of matters. The Action states that the rejected claims do not include any limitation to a practical application in the technological arts because the claims require generating a "code," which is "a signal per se" that is not applied to a practical application. Applicants respectfully disagree because the Action has not followed the required analysis set forth in the MPEP for determining whether the claimed invention is statutory or not.

According to MPEP 2106 (II), prior to focusing on specific statutory requirements, Office personnel must begin examination by determining what, precisely, the applicant has invented and is seeking to patent, and how the claims relate to and define that invention. As the courts have repeatedly reminded the Office: "The goal is to answer the question 'What did applicants invent?' Consequently, Office personnel will no longer begin examination by determining if a claim recites an abstract idea. Rather they will review the complete specification, including the detailed description of the invention,

any specific embodiments that have been disclosed, the claims and any specific, substantial, and credible utilities that have been asserted for the invention.

With respect to signal processing inventions, the MPEP states that there is always some form of physical transformation within a computer because a computer acts on “signals” and transforms them during its operation and changes the state of its components during the execution of a process. Even though such a physical transformation occurs within a computer, such activity is not determinative of whether the process is statutory because such transformation alone does not distinguish a statutory process from a nonstatutory process. What is determinative is not how the computer performs the process, but what the computer does to achieve a practical application.

For a subject matter to be statutory, the claimed process must be limited to a practical application of the abstract idea or mathematical algorithm in the technological arts. A claim is limited to a practical application when the method, as claimed, produces a concrete, tangible and useful result; i.e., the method recites a step or act of producing something that is concrete, tangible and useful. Likewise, a machine claim is statutory when the machine, as claimed, produces a concrete, tangible and useful result and/or when a specific machine is being claimed. For example, a computer process that simply calculates a mathematical algorithm that models noise is nonstatutory. However, a claimed process for digitally filtering noise employing the mathematical algorithm is statutory. (See MPEP 2106 IVB2(b))

Applying the above principals to the instant invention requires ascertaining what did Applicants invent. According to claim 1, as amended, Applicants have invented defining one or more communication channels in an Ultra Wideband system. Such

communication channels have many applications by allowing for transmission and reception of information. Consequently, the present invention produces concrete, tangible and useful result. As recited, the claimed method requires generating at least one code having at least one code element value representing one or more of amplitude and/or type of an Ultra Wideband waveform, which is associated with the one or more code element values to define the one or more communication channels.

As stated above, the claimed invention expressly requires the non-temporal characteristic to comprise at least one of amplitude and/or type. Thus, the claimed non-temporal characteristic being either one of amplitude and/or type is not an abstract idea. The amplitude is not abstract because it can be represented by a magnitude. Similarly, the type is not abstract because as recited in Claim 22, it can be any one of a square wave pulse, a sawtooth pulse, a Haar wavelet pulse, a Gaussian monopulse, a doublet pulse, a triplet pulse; and a set of wavelets of an Ultra Wideband waveform. Therefore, it is respectfully submitted that Claims 1, 6-20, and 22-25 are directed to statutory subject matter, because the invention produces concrete, tangible and useful result by allowing communication of information over channels defined by amplitude and/or type of Ultra Wideband waveform.

**35 USC 103(a) Rejection:**

Claims 26, and 31-36 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Publication No. U.S. 2003/0053555 A1 issued to McCorkle et al. (McCorkle) in view of U.S. Patent No. 6,603,818 issued to Dress, Jr. et al. (Dress). For the reasons set forth below, the applicants respectfully disagree.

**Response to Action's Remarks Regarding Channelization:**

The Action does not find Applicants previous arguments regarding “communication channel” persuasive. Citing Fullerton 5,832,035 Patent, the Action states that the number of channels is only limited by the complexity and uniqueness of orthogonal PN codes. To be clear, Fullerton 5,832,035 Patent concerns PN codes defining different time hopping sequences (i.e., different combinations of relative pulse positions in time) such that the number of pulse coincidences of two impulse radio signals having different codes arriving at a receiver is low enough that the signals can be discerned by the receiver. As such, Fullerton does not teach or suggest using non-temporal characteristics to define communication channels.

Based on the teaching of Fullerton, the Action states that orthogonality is the primary consideration of an impulse radio channel. Since the use of orthogonal codes reduces likelihood of interference by multiple signals at a receiver, it is fair to say that orthogonality is certainly one consideration in channelization. However, there are other considerations, such as spectral properties that depending on application, may be of more importance than orthogonal channel characteristics.

The Action states that the “use of orthogonal pulse shapes would provide an additional degree of freedom to the already existing impulse radio channels, allowing for an increase in the number of channels.” It appears that the Action is equating the main objective of the present invention as increasing the number of channels. In fact, the present invention provides a different approach to channelization in Ultra Wideband systems regardless of whether the number of channels are increased or not. Unlike prior art approaches, (e.g., such as Fullerton 5,832,035 Patent), which use temporal

characteristics for channelization, the present invention uses non-temporal characteristics and more specifically amplitude and/or type of Ultra Wideband waveforms to provide channelization. For channelization in one exemplary embodiment, the present invention applies PN codes to pulse amplitudes and/or pulse types (or shapes), which are non-temporal characteristics. It should be noted that a "pulse" is only one example of Ultra Wideband waveforms that can be used in the present invention. Any other type of Ultra Wideband waveform and wavelets may also be used for channelization in accordance with the present invention.

The channelization of the present invention does not necessarily have to use orthogonal codes. In fact, depending on application and operating conditions, the present invention can use codes, which may or may not be orthogonal with respect to each other. Thus, the statement in the Action regarding "the use of orthogonal pulse shapes would provide an additional degree of freedom to the already existing impulse radio channels by allowing for an increase in the number of channels" misses the point on the claimed invention. This is because the purpose of the present invention is not to provide an additional degree of freedom to increase the number of channels. Rather, the present invention provides an alternative to channelization in Ultra Wideband systems by using amplitude and/or type of waveforms. Of course, as recited in the more narrow dependent claims, the present invention could use temporal and non-temporal characteristics together. But, in contrast to what is implied in the Action, the channelization method of the invention does not require using temporal and non-temporal characteristics together.

The Action states that "it can be further argued that to 'define a communications channel' reflects intended use and is not a patentable limitation, since Dress suggest a

plurality of uses for this additional degree of freedom." It should be pointed out that the present invention is in fact related to an Ultra Wideband system and method that defines one or more communication channels. Therefore, defining communication channels is not an intended use, rather it is the stated purpose of the invention. Once again, it is not necessarily the objective of the present invention to increase the number of channels, rather, the present invention provides an alternative system and method for channelization in Ultra Wideband systems.

In Col 3, lines 55-67, Dress suggests a degree of freedom to control the transmission's spectral properties, thereby allowing a wider range of applications, greater receiver selectivity, and the ability to avoid known interferers and reduce potentially harmful interference to existing radio frequency services and users. Thus, Dress does not teach or suggest associating PN codes with type (shape) or amplitude of Ultra Wideband waveforms to define communication channels. Instead, Dress teaches a multiplexing/demultiplexing technique whereby orthogonal waveforms are independently modulated (i.e., each waveform represents a separate data channel) and then combined into a composite waveform. Channelization is achieved by time hopping (position modulation) of the composite waveform in accordance with a PN code and/or by width modulating the composite waveform in accordance with a PN code (see discussion concerning figs. 12-14, in particular col 11, lines 1-27). It should be pointed out that "the additional degree of freedom" discussion in Dress only pertains to controlling spectral properties but not to defining communications channels. As explained further below, unlike the present invention, Dress does not teach or suggest the use of orthogonal shapes or amplitudes to define communication channels.

The Action argues that "how one defines a channel is subjective and not limited to inventor's definition". Applicant is at a loss as to what this statement means. If the Action argues that a channelization method is non-statutory subject matter, Applicant respectfully disagrees for the reasons set forth above in connection with arguments made against rejection of claims for being directed to non-statutory subject matter. The Action states that "the channel of an impulse radio system, as generally understood in the art, is a time hopping code." It is respectfully submitted that the use of time hopping code is only one of many known ways for creating channels, but there are others. Fullerton and Dress each teach the use of time positions to define channels. Dress also teaches the use of pulse width to define channels. McCorkle teaches the use of pulse polarity to define channels. In contrast, the present invention uses type and/or amplitude of the Ultra Wideband waveforms to define channels. No such feature is disclosed in any of the prior art of record.

The Action characterizes the present invention as an "improvement to the already existing channel..., by adding characteristics to the pulse for increasing the number of channels." Applicant respectfully submits that the Action has not fully understood the true scope of the invention. First of all, the present invention does not add characteristics to the pulse because such characteristics, e.g., amplitude and type, are already inherent to non-temporal characteristics of Ultra Wideband waveforms. Instead, the present invention uses amplitude and/or type of such Ultra Wideband waveforms to provide channelization. Again, it is not necessarily the objective of the present invention to increase the number of channels, rather, the main objective of the present invention is to provide an alternative system and method for channelization.

**Response to Obviousness Rejection:**

In connection with the obviousness rejection, the Action states that McCorkle teaches associating code elements of a code to inverted/non-inverted (non-temporal) pulse characteristics to define a communications channel. The Action concedes that McCorkle fails to teach "using non-temporal characteristic for the purpose of increasing the number of channels in communications system." The Action cites Dress for teaching a pulse transmission system which provides an additional degree of freedom to time-domain communications by controlling the shape of the transmitted pulse. Citing Col. 3, lines 60-65, the Action states that Dress teaches using the pulse shape for improved receiver selectivity. The Action concludes that it would have been obvious to one having ordinary skill in the art at the time of the invention to modify McCorkle's communication system with teaching of Dress regarding the use of orthogonal pulse shapes since, Dress suggest that a pulse communications systems performance would be improved with the additional degree of freedom provided such modifications. For the reasons set forth below, Applicants respectfully disagree.

It is agreed that McCorkle teaches associating code elements of a code to inverted/non-inverted (non-temporal) pulse characteristics to define communication channels. In other words, McCorkle teaches defining communications channels by a combination of inverted and non-inverted pulses. As conceded by the Action, McCorkle fails to teach associating code elements of a code to the non-temporal pulse characteristics of amplitude and/or type of Ultra Wideband waveforms. For the reasons set forth below, this deficiency in McCorkle is not cured by Dress.

Dress discloses a method for pulse communications that generates a modulated pulse signal waveform that is transformed into a higher-order derivative waveform, which is transmitted as an emitted pulse. Dress purports to increase data rate by combining multiple orthogonal pulse types together in order to achieve parallel data paths and controlling spectral properties. Dress also reduces lower-frequency emissions from pulse transmission as well as harmful interference to existing radio frequency services and users, while permitting transmission of multiple data bits utilizing specific pulse shapes.

In Dress, however, communication channels are defined by codes that specify time delays that vary the spacing between individual composite signals. Dress also teaches defining channels by varying the width of the composite signal in accordance with one or more codes. However, neither Dress nor McCorkle teach or suggest using amplitude and/or type of Ultra Wideband waveforms to define communication channels.

One of ordinary skill in the art would recognize that the text pointed out by the Action, i.e., Col. 3, lines 60-65, for rejecting the claimed invention, concerns controlling spectral properties that, for example, allows greater receiver selectivity to be achieved or in other words better use of filters by the receiver to pick out the wanted signal from all the other ones around it. Receiver selectivity in Dress, however, does not relate to using codes to define communication channels, as required by the claimed invention. The only channelization techniques taught by Dress involve varying the time position and/or the width of the combined orthogonal signals (i.e., the composite signal) in accordance with one or more PN codes. Dress does not suggest or teach associating code elements of a

code to either amplitude or type of Ultra Wideband waveforms to define communication channels.

As claimed, the present invention relates to defining one or more communication channels over which information can be communicated, i.e., received or transmitted. The information may correspond to data bits (or any other type of information attribute) that are modulated onto the communication channel. More specifically, a code under the invention has one or more code element values that represent a non-temporal characteristic of an Ultra Wideband waveform, in terms of amplitude and/or type (or shape) of Ultra Wideband signals. It should be noted that the claimed requirements for the non-temporal characteristic being one of amplitude and/or type are mutually exclusive. In other words, for channelization, the non-temporal characteristic can comprise any one of, or a combination of, amplitude and type of Ultra Wideband waveforms.

With Dress, type characteristics of Ultra Wideband waveforms are used for modulation of information. Whereas, the present invention uses such characteristics for channelization. Communications channels in accordance with the present invention are defined by codes that are associated with amplitude and/or type of Ultra Wideband waveforms. Such defined channels are used by the transmitter when generating and transmitting the waveforms that must be known to a receiver that receives the transmitted waveforms.

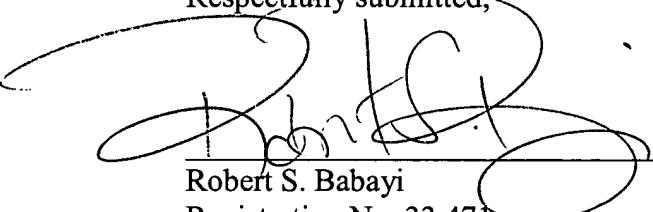
Moreover, it is respectfully submitted that McCorkle and Dress cannot even be combined to provide a working communication system. This is because McCorkle phase modulates an entire PN coded sequence of inverted and non-inverted pulses while Dress

modulates multiple orthogonal waveforms independently (using any one of various modulation methods) that are then combined into a composite signal. Relying on McCorkle and Dress, the Action attempts to make a *prima facie* case for obviousness by arguing that the combined teachings of these references teach each and everyone of the claimed limitations of the invention. Applicant respectfully disagrees, because the cited rejection amounts to an improper use of hindsight where the invention is used as a template for piecing together the prior art for the obviousness rejection. It is respectfully submitted that none of the references alone or in combination teach or suggest using amplitude or type of Ultra Wideband waveforms to define communication channels as required by the present invention.

In view of the above, it is respectfully submitted that all pending claims are now in allowable condition. Early issuance of a Notice of Allowance is respectfully solicited.

If the Examiner is of the opinion that the prosecution of this application would be advanced by a personal interview, the Examiner is invited to telephone undersigned counsel to arrange for such an interview.

Respectfully submitted,

  
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Date

Robert S. Babayi  
Registration No. 33,471  
VENABLE  
P.O. Box 34385  
Washington, D.C. 20043-9998  
Telephone: (202) 344-4800  
Facsimile : (202) 344-8300

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